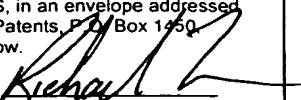


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
APPLICATION FOR UNITED STATES LETTERS PATENT

Title:

**MULTI-LAYER BRISTLE**

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# **MULTI-LAYER BRISTLE**

## **RELATED APPLICATION**

This application claims priority from U.S. provisional application Serial Number 60/393,963, filed July 3, 2002.

## **FIELD OF INVENTION**

The present invention relates generally to bristles and, more particularly, to multi-layer bristles for use in cleaning products.

## **BACKGROUND**

Cleaning tools such as brooms and brushes have bristles attached thereto for collecting dust and debris from a surface, or for scrubbing the surface to remove stains. Such cleaning tools are designed to provide general cleaning functions. Although the aforementioned cleaning tools perform adequately for general everyday cleaning, they lack functionally effective bristle designs for special cleaning needs. Furthermore, the current bristle designs and materials do not provide highly effective cleaning that even the most common cleaning applications demand.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a side elevational view of a bristle constructed in accordance with the teachings of the present disclosure.

FIG. 2 is a cross sectional view of a two-layer bristle constructed in accordance with the teachings of the present disclosure.

FIG. 3 is a cross sectional view of a three-layer bristle constructed in accordance with the teachings of the present disclosure .

FIG. 4 is a cross sectional view of a first example of a two-layer flagged tip bristle constructed in accordance with the teachings of the present disclosure.

FIG. 5 is a side elevational view of the bristle of FIG. 4.

FIG. 6 s a side elevational view of the bristle of FIG. 4 showing the bristle in a flagged-tip configuration.

FIG. 7 is a cross sectional view of a second example of a two-layer flagged tip bristle constructed in accordance with the teachings of the present disclosure.

FIG. 8 s a side elevational view of the bristle of FIG. 7 showing the bristle in a flagged-tip configuration.

FIG 9. is a diagrammatic view of a broom having bristles constructed in accordance with the teachings of the present disclosure.

FIG. 10 is a diagrammatic view of a brush having bristles constructed in accordance with the teachings of the present disclosure.

#### **DETAILED DESCRIPTION**

Referring to FIGS. 1- 8 of the drawings, exemplary bristles 10, 12 and 14, constructed in accordance with the teachings of the present disclosure are shown. Bristle 10 is a two-layer bristle that includes a core 20 and an outer layer 22, while bristle 12 is a three-layer

bristle that includes a core 24, an intermediate layer 26, and an outer layer 28. One of ordinary skill in the art will readily appreciate that any number of layers in a bristle constructed in accordance with the teachings of the invention can be provided. Referring to Fig. 3, bristle 14 is a two-layer flagged tip bristle that includes a core 30 and an outer layer 32. Bristle 14 mechanically flags at the tip upon impact (i.e., the outer layer 32 splays and separates from the core 30), to provide multiple smaller bristles 34 from one bristle 14.

Referring to FIG. 1, each of the bristles 10, 12 and 14, which is generally shown in FIG. 1 as bristle 15, includes an attachment end 31 and a free cleaning tip end 33 that are disposed along a longitudinal axis 29. The attachment end 31 of the bristle 15 is typically attached to a cleaning device, a tool or the like, and therefore is fixed, while the cleaning tip end 33 is free. The bristle 15 is flexible but resiliently resists bending. A plurality of bristles 15 are generally attached to a cleaning device such as a broom 39 or a brush 41, as shown in FIGS. 9 and 10. The cleaning tip ends 33 of the plurality of bristles define a cleaning head 35. When the cleaning head 35 is pressed on a surface and moved in a cleaning direction (not shown), the cleaning tip ends 33 of the bristles collectively dislodge dirt, debris and small objects from the surface. Furthermore, because the bristles 15 bend opposite the cleaning direction, the resilient flexibility of each bristle 15 causes the dislodged and collected dirt and debris to be pushed forward of the cleaning direction. One of ordinary skill in the art will readily appreciate that the

density of the cleaning tip ends 33 on the cleaning head 35 combined with the length, the thickness, the length to thickness ratio, the flexibility, and the cross sectional shape of each bristle 15, are a few of the many factors that may influence the cleaning characteristics of the cleaning device, a tool or the like. Additionally, as will be described in the following, the construction materials of each bristle 10, 12 and 14 influence the cleaning and functional characteristics of a cleaning device, a tool or the like.

Referring to the bristle 10 shown in FIG. 2, the core 20 and the outer layer 22 can be constructed with different materials to provide a particular function for a tool to which the bristle 20 is attached. In a first example of the two-layer bristle 10, a rubber bristle is constructed with Polypropylene, Poly Vinyl Chloride, or the like for the core 22, and a thermoplastic elastomer, rubber, or the like for the outer layer 20. The core 22 provides a stiffer structure than a bristle that is constructed solely from rubber, while the softer outer layer 20 provides better cleaning and is non-abrasive so as to prevent scratching of a surface to which it is applied.

In a second example of the two-layer bristle 10, a germ-free bristle is constructed with an antimicrobial material for the outer layer 20. For example, the outer layer 20 can be constructed with silver zeolite, triclosan, or similar antimicrobial materials. The core 22 can be constructed from Polypropylene, Poly Vinyl Chloride, or any similar

material that may be well known to those of ordinary skill in the art to be suitable for such a purpose.

In a third example of the two-layer bristle 10, a recycled bristle is constructed with one or more recycled materials for either the core 22, the outer layer 20, or both the core 22 and the outer layer 20. The recycled material for the core 22 can include recycled resin. The recycled material for the outer layer 20 can include a polymeric resin or plastic resin mixed with finely dispersed particles of a natural fiber, such as, wood, cotton, tampico, palmyra, broom corn, coco, or the like.

In a fourth example of the two-layer bristle 10, a dust bristle is constructed with an outer layer 20 that has electrically static or anti-static properties to improve dust cleaning by attraction and/or release of dust particles, respectively. Materials with such electrical properties include ethoxylated aliphatic amines and amides, quaternary ammonium salts, glycol esters, nonionic surfactants, or other materials that are well known to those of ordinary skill in the art. The core layer 22 can be constructed from rubber. One of ordinary skill in the art will readily appreciate, however, that the core layer 22 can be constructed from Polypropylene, Poly Vinyl Chloride, or the like so as to provide a stiffer structure than a bristle that is constructed solely from rubber.

In a fifth example of the two-layer bristle 10, the outer layer 20 is constructed with a hydrophilic (i.e., water absorbing) material, such as cotton, to provide a water absorbing cleaning tool. Similarly, the outer

layer 20 can be constructed with a hydrophobic (i.e., water repelling) material, such as polystyrene or a rubber blend, to provide a water repelling cleaning tool. The core layer 22 can be constructed from rubber. One of ordinary skill in the art will readily appreciate, however, that the core layer 22 can be constructed from Polypropylene, Poly Vinyl Chloride, or the like so as to provide a stiffer structure than a bristle that is constructed solely from rubber.

Referring now to the multi-layer bristle 12 shown in Fig. 2, the core 24, the intermediate layer 26, and the outer layer 28 can include any of the aforementioned materials disclosed in relation to the two-layer bristle to provide similar specialized functions. One of ordinary skill in the art will readily appreciate that a three-layer bristle may provide specialized functions in addition to the exemplary functions disclosed in relation to the two-layer bristle. Furthermore, bristles with more than three-layers can be constructed to provide highly unique cleaning functions in addition to those disclosed in relation to the two-layer bristle.

Referring now to FIGS. 4-6, a first example of a flagged tip bristle 14 is shown. As shown in FIG. 6, the core 30 is cross shaped. Accordingly, the outer layer 32 forms four pie-shaped segments that surround the core 30. Upon impact of the bristle 14 with a surface, the outer layer 32 will separate from the core 30 at the tip of the bristle 14 and will splay. To provide such separation or flagging of the tip of the bristle 14 upon impact, the outer layer 32 includes a resin that does not

provide a strong bond with the material used for the core 30. The flagging of the bristle 14 will provide a fuller bristle 14 at the tip by creating multiple smaller bristles 34 from one flagged tip bristle 14 in a controlled manner. In other words, the flagging provides a cleaning head 35 having a larger number of cleaning tip ends 33 than a cleaning head 35 of comparable size having the same number of bristles. The cross sectional shape of the core 30 can be chosen to provide desired flagging characteristics. Thus, the shape and size of each of the flagged tips 34 can be controlled as desired by accordingly designing the cross sectional shape of the core 30. For example, as shown in FIG. 4, the core 30 is cross shaped. Accordingly, upon mechanical flagging of the tip of the bristle 14 (i.e., impact of the tip with a surface), the outer layer 32 separates from the core 30 at the tip of the bristle 14 to form four similarly shaped smaller bristles 34.

Referring to FIGS. 7 and 8, a second example of a flagged tip bristle 14 is shown. The outer layer 32 includes a plurality of serrations 37 in addition to including a resin that does not provide a strong bond with the material used for the core 30. The serrations 37 are disposed on the outer layer 32 at the cleaning tip end 33 and running upward a distance along the longitudinal axis 29. Accordingly, impact of the bristle 14 with a surface causes the outer layer 32 to break along the serrations 37 (shown in FIG. 8), and the weak bond between the outer layer 32 and the core 30 causes the flagged tips to splay from the core 30.

In the disclosed examples, each outer layer 22, 28 and 32 is shown in FIGS. 2, 3, 4 and 7 to be concentric with each core layers 20, 24 and 30, respectively. One of ordinary skill in the art will readily appreciate, however, that the multiple layers of the disclosed bristles 10, 12 and 14 may be non-concentric to provide different functional characteristics than a concentric bristle. Such functional characteristics may include, for example, variations in bending and resiliency characteristics of the bristle that depend on the bending direction.

The disclosed multi-layer bristles can be manufactured by methods well known to those of ordinary skill in the art. However, in the preferred example, the multi-layer bristles are manufactured by co-extrusion of the multiple layers in the bristles. One of ordinary skill in the art will appreciate that extrusion of multi-layer bristles is similar to conventional profile co-extrusion with multiple extruders feeding a crosshead die with the desired cross section.

Referring to FIGS. 9 and 10, two exemplary cleaning tools 39 and 41 constructed with the disclosed multi-layer bristles are shown. FIG. 9 shows a broom 39 that includes multi-layer bristles that can be used for common or special applications. The broom 39 includes a base 43 and a handle 45. Each multi-layer bristle is attached to the broom 39 at the attachment end thereof. The cleaning tip ends 33 of the multi-layer bristles are free and form the cleaning head 35. Similarly, as shown in FIG. 10, the brush 41 includes multi-layer bristles that can be used for

common or special applications. The brush includes a base 47 that can be held by a user during application, and a number of multi-layer bristles that are attached to the base 47 at the attachment ends 31 thereof. One of ordinary skill in the art will appreciate that any tool or device that uses bristles can include the disclosed multi-layer bristles. For example, the disclosed multi-layer bristles can be used for function specific cleaning tools and grooming tools, such as, toothbrushes, street cleaning machines, shoe shining and cleaning brushes, hair brushes, and other bristle type tools. One of ordinary skill in the art will further appreciate that the disclosed multi-layer bristles can be used in a wide variety of tools other than cleaning devices. For instance, a paint brush can be constructed having the disclosed multi-layer bristles to provide a desired paint application characteristic.

Persons of ordinary skill in the art will appreciate that, although the teachings of the invention have been illustrated in connection with certain embodiments, there is no intent to limit the invention to such embodiments. On the contrary, the intention of this application is to cover all modifications and embodiments fairly falling within the scope of the teachings of the invention.